

CLASSIFICATION:

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EXHIBIT R-2, RDT&E Budget Item Justification							DATE:	
							February 2003	
APPROPRIATION/BUDGET ACTIVITY					R-1 ITEM NOMENCLATURE			
RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY / BA-5					0604264N/Aircrew Systems Development			
COST (\$ in Millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Total PE Cost	15.915	7.524	8.765	8.032	3.662	2.608	2.733	2.729
W0606 Aircrew Systems Development	8.344	6.547	8.765	8.032	3.662	2.608	2.733	2.729
W2877 Joint Helmet Mounted Cueing System	2.412							
W2879 SIIS Ejection Program	0.977	0.977						
W9061 Intensifier Tube Advanced Development	4.182							
U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:								
The Aircrew Systems Development program provides engineering and manufacturing development (EMD) of Aviation Life Support Systems to protect aircrews from current and future threats including: directed energy weapons, chemical/biological/radiological agents/fallout, ballistic projectiles, temperature extremes, heat/fire, low concentration oxygen environments, high dynamic forces during emergency egress, and high "G" forces. The program also provides development for the following capabilities: head protection, in flight restraint and stability emergency egress and descent, escape and evasion, survival and rescue, crash protection, and anthropometric sizing for small aircrew. Acquisition initiatives include: competition, the application of streamlining initiatives, use of non-developmental items (NDI), joint and tri-service developments, and the pursuit of NATO/allied cooperative ventures, which expedite introduction of new products into Navy and Marine Corps fixed and rotary wing aircraft, reduce costs, and promote commonality.								

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 Exhibit R-2, RDTEN Budget Item Justification
 (Exhibit R-2, page 1 of 13)

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EXHIBIT R-2a, RDT&E Project Justification							DATE: February 2003	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-5	PROGRAM ELEMENT NUMBER AND NAME 0604264N/Aircrew Systems Development				PROJECT NUMBER AND NAME W0606/Aircrew Systems Development			
COST (\$ in Millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Project Cost	8.344	6.547	8.765	8.032	3.662	2.608	2.733	2.729
RDT&E Articles Qty								

U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:

(U) SUBPROJECTS:

- (U) **ESCAPE AND CRASH SAFETY:** Navy Aircrew Common Ejection Seat Pre-Planned Product Improvement (NACES P3I), Advanced Crashworthy Aircrew Survival Systems (ACASS), Joint Cockpit Air Bag System (JCABS), Crashworthy Troop Seats (CWTS), Escape System Injury Reduction Program (ESIRP) for aircrew using helmet mounted systems and small occupants (formerly NON-NACES and Small Occupant Escape System).

- (U) **LIFE SUPPORT/THREAT PROTECTION:** Extreme Cold Weather Improvement Program/State of the Art Survival Items (ECWIP/SOASI), Personal Protective Apparel (PPA) formerly AMELIA, Aircrew Accommodation Expansion Program (AAEP), Aviation Oxygen Systems (AOS), Aircrew Exposure Protection Systems (AEPS) formerly Aircrew Cooling/Advanced Integrated Life Support Systems (AILSS), Liquid Oxygen to ON-Board Oxygen Generating System (LTO), Common Smoke Mask (CSM), Joint Protective Air Crew Ensemble (JPACE), Combat Survivor Evader Locator (CSEL), and Mobile Aircrew Restraint System (MARS)/Tri-Service Safety Harness (TSSH).

- (U) **HELMET, VISION AND DISPLAYS:** Night Vision Systems (NVS), Joint Helmet Mounted Cueing System (JHMCS), Integrated Day/Night All Weather Helmet (IDNAWH), Wide Field of View (WFOV) Night Vision Goggle (formerly Panoramic Night Vision Goggle (PNVG), JHMCS Night Attack, Agile Frequency Laser Eye Protection, and Laser Eye Protection Improvement Program (LEPIP), Joint Aircrew Laser Eye Protection Visor (JALEPV).

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(U) B. Accomplishments/Planned Program				
	FY 02	FY 03	FY 04	FY 05
Accomplishments/Effort/Subtotal Cost	2.852	2.416	2.791	1.670
RDT&E Articles Quantity				
<p>FY 2002 - NACES P3I: Continued aircraft (A/C) platform installation of phase I technologies. Initiated retrofit ECP for JHMCS provisions. Finalized phase II injury risk reduction trade study and established pricing for candidate modifications. Completed qualification tests (DT) and delivered first production units of selected phase II candidate modifications. AV-8B: Completed system and qualification testing (DT) and commenced A/C platform installation of performance improvements. Completed CDR and testing of Electronic Airspeed Altitude Sensor (EAAS). CWTS: Delivered initial production quantities of H-1 system and completed on aircraft integration assessments. Continued preliminary design on H-3 and H-46. ESIRP: Purchased long lead DT test hardware and prototype design fabrication. Completed SRD and PDR. FY 2003 - NACES P3I: Continue A/C platform installation of phase I technologies. Begin retrofit of JHMCS provisions. Initiate system design interface and system demonstration testing (DT) on selected phase II injury risk reduction candidate technology improvements. Continue production incorporation of selected phase II candidate modifications. AV-8B: Continue A/C platform installation of performance improvements and begin EAAS installation. CWTS: Implement design weight changes for H-1 and conduct delta demonstration testing (DT). Complete H-3/H-46 design efforts and incorporate ECP's. ESIRP: Conduct system level risk reduction demonstration (DT). Conduct component qualification (component DT) on selected stability and restraint candidate system technologies. Conduct CDR. FY 2004 - NACES P3I: Complete aircraft platform installation of phase I technologies. Complete design interface and system demonstration testing (DT) of selected phase II technologies and begin qualification efforts. AV-8B: Complete A/C platform installations of performance improvements and EAAS. Complete component qualification testing (DT) of restraint upgrades. CWTS: Commence installation of H-1 crashworthy seats. Conduct seat integration and demonstration testing (DT) for H-3/H-46 designs. ESIRP: Conduct system level qualification testing (DT) on select stability and restraint candidate system technologies. Commence preparation of platform ECP's. FY 2005 - NACES P3I: Complete system qualification testing and commence A/C incorporation of select phase II technologies. AV-8B: Complete ECP's and begin incorporation of restraint improvements. CWTS: Complete qualification (DT) of H-3/H-46 designs. ESIRP: Complete platform ECP's and begin aircraft introduction of stability and restraint candidate technologies.</p>				
	FY 02	FY 03	FY 04	FY 05
Accomplishments/Effort/Subtotal Cost	3.330	1.541	2.866	3.743
RDT&E Articles Quantity				
<p>FY 2002 - ECWIP/SOASI: Continued evaluations and authorizations of state of the art survival items to include research of SOASI specific to Fleet for military hostile operations. PPA: Initiated DT IIA and preliminary NTAB fleet assessment of potential multi-climate protection system. AAEP: Completed mapping of all USN/USMC pilot crew stations. Published NAVAIRINST 3710.9C. Drafted technical report with anthropometric restriction codes on all aircraft. AEPS/AILSS: Completed testing initiated in FY-01. Developed warfare analysis of requirements. Drafted ORD. LOX TO OBOGS (LTO): Continued acquisition planning for replacement of Liquid Oxygen System with OBOGS for Naval Aircraft; prepared program documentation to include Systems Requirements Document (SRD) Program Development Plan, EA-6B integration study, prepared OBOGS performance spec, altitude lab preparation, conducted dynamic consumption test. CSM/AOS: Prepared sources sought and conducted market research. Performed feasibility analysis on Solid State Oxygen Monitor (SSOM) improvement alternatives. TSSH/MARS: Performed modeling studies to identify crashworthy mounting locations in aircraft cabin. Conducted HH-60H aircraft ground assessment to define operational mission requirements and to identify feasible mounting locations. Performed initial structural analysis for candidate mounting locations. Conducted follow-up aircraft assessments for SH-60B/F aircraft. Developed draft system performance specification. Prepared Statement of Work (SOW) and solicitation package for H60 series aircraft. FY 2003 - ECWIP/SOASI: Continue evaluations and authorizations of state of the art survival items. PPA: Conduct DT IIB testing to evaluate fit, performance and capability, finalize designs and procure systems in LRIP quantity for a fleet assessment. AAEP: Evaluate additional aircraft seat position (crew seats, flight engineer) in aircraft to equip for accommodation issues. Continue development of detailed cockpit CAD images and establish updated population anthropometric data collected by Digital Anthropometric Video Imaging Device (DAVID) or whole body scanners.</p>				

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(U) B. Accomplishments/Planned Program

AEPS/AILSS: ORD Staffing. Program Planning. Prepare Acquisition Plan and Risk Assessment demonstrated technology. LOX TO OBOGS (LTO): Conclude integration studies of EA-6B aircraft and continue risk reduction and acquisition planning for remaining LOX equipped Naval Aircraft. CSM/AOS: Publish sources sought and continue DT of full face smoke masks and 02 containment devices for Naval fixed wing non-ejection aircraft. Perform technical evaluation for CSM. Complete program development plan for all platforms. TSSH/MARS: Conduct DT on H-60 MARS. Conduct modeling studies on other USN/USMC platforms. Prepare/revise system performance specification to accommodate additional platform requirements. Prepare solicitation data package for additional platforms. FY 2004 - ECWIP/SOASI: Continue evaluation and authorizations of state of the art survival items. PPA: Complete fleet assessment, finalize technical data package, begin procurement and fielding of the Multi-Climate Protection System. AAEP: Continue evaluating additional aircraft seat positions in aircraft so equipped for accommodation issues. Publish technical reports on accommodation levels in aircraft. Continue developing detailed cockpit CAD pictures. Reevaluate aircraft and anthropometric restriction codes as modifications to existing aircraft and/or aircrew clothing and equipment occur or as new aircraft are introduced. AEPS/AILSS: Continue PDRR, MS B. Release competitive solicitation. LOX TO OBOGS (LTO): Conclude integration studies of E-2 aircraft and continue risk reduction and acquisition planning for remaining LOX equipped Naval Aircraft. CSM/AOS: Continue DT of full face smoke masks and 02 containment devices for Naval fixed wing non-ejection aircraft. TSSH/MARS: Conduct DT on follow-on USN/USMC platforms. Provide upgraded MARS to Joint Service platforms and identify Joint Service requirements. FY 2005 - ECWIP/SOASI: Continue evaluations and authorizations of state of the art survival items. PPA: Continue procurement and fielding of MCP system. AAEP: Reevaluate aircraft and anthropometric restriction codes as modifications to existing aircraft and/or aircrew clothing and equipment occur, or as new aircraft are introduced. AEPS/AILSS: Conduct DT testing. LOX TO OBOGS (LTO): Conclude integration studies of F-18 equipped aircraft and continue risk reduction for remaining LOX equipped Naval Aircraft. CSM/AOS: Conduct initial product demonstrations of full smoke masks and 02 containment devices for Naval fixed wing non-ejection aircraft. TSSH/MARS: Commence DT and prepare ECP.

	FY 02	FY 03	FY 04	FY 05
Accomplishments/Effort/Subtotal Cost	2.162	2.590	3.108	2.619
RDT&E Articles Quantity				

FY 2002 - NVS: Continued to monitor and participate in PNVG Advanced Technology Development. JHMCS: Completed F/A-18 E/F DT/OT, LRIP III, reengineered F/A-18 C/D integration, JHMCS Night Attack: Completed studies. JALEPV: Received LRIP approval. FY 2003 - NVS: Continue to monitor and participate in WFOVNVG (formerly PNVG) testing. JHMCS: F/A-18 E/F Correct OT deficiencies, F/A-18 E/F MS III. JHMCS Night Attack: Interface Control Design (CD). JALEPV: Start Fleet assessment. LRIP II. IDNAWH: Program Design Review (PDR). FY 2004 - JHMCS P3I Night Attack: Initiate DT. JALEPV: MS III. LEPIP: (formerly Laser Spectacle Improvements): Commence DT. IDNAWH: Initiate DT/OT. FY 2005 - JHMCS P3I Night Attack: Initiate OT. IDNAWH: Continue DT/OT. NVS: WFOVNVG testing. Agile Frequency Laser PDR.

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<p>(U) C. PROGRAM CHANGE SUMMARY:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"></th> <th style="text-align: right;">FY 2002</th> <th style="text-align: right;">FY 2003</th> <th style="text-align: right;">FY 2004</th> <th style="text-align: right;">FY 2005</th> </tr> </thead> <tbody> <tr> <td>(U) Funding:</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Previous President's Budget:</td> <td style="text-align: right;">7.649</td> <td style="text-align: right;">6.695</td> <td style="text-align: right;">8.679</td> <td style="text-align: right;">7.404</td> </tr> <tr> <td>Current BES/Presidents Budget:</td> <td style="text-align: right;">8.344</td> <td style="text-align: right;">6.547</td> <td style="text-align: right;">8.765</td> <td style="text-align: right;">8.032</td> </tr> <tr> <td>Total Adjustments</td> <td style="text-align: right; border-top: 1px solid black;">0.695</td> <td style="text-align: right; border-top: 1px solid black;">-0.148</td> <td style="text-align: right; border-top: 1px solid black;">0.086</td> <td style="text-align: right; border-top: 1px solid black;">0.628</td> </tr> <tr> <td colspan="5" style="padding-top: 10px;">Summary of Adjustments</td> </tr> <tr> <td> Congressional program reductions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> Congressional undistributed reductions</td> <td></td> <td style="text-align: right;">-0.039</td> <td></td> <td></td> </tr> <tr> <td> Congressional rescissions</td> <td style="text-align: right;">-0.016</td> <td></td> <td></td> <td></td> </tr> <tr> <td> SBIR/STTR Transfer</td> <td style="text-align: right;">-0.041</td> <td></td> <td></td> <td></td> </tr> <tr> <td> Economic Assumptions</td> <td style="text-align: right;">-0.024</td> <td style="text-align: right;">-0.109</td> <td style="text-align: right;">-0.255</td> <td style="text-align: right;">-0.210</td> </tr> <tr> <td> Reprogrammings</td> <td style="text-align: right;">0.776</td> <td></td> <td></td> <td></td> </tr> <tr> <td> Other Navy/OSD Adjustments</td> <td></td> <td></td> <td style="text-align: right;">0.341</td> <td style="text-align: right;">0.838</td> </tr> <tr> <td> Subtotal</td> <td style="text-align: right; border-top: 1px solid black;">0.695</td> <td style="text-align: right; border-top: 1px solid black;">-0.148</td> <td style="text-align: right; border-top: 1px solid black;">0.086</td> <td style="text-align: right; border-top: 1px solid black;">0.628</td> </tr> </tbody> </table> <p style="margin-top: 20px;">(U) Schedule:</p> <p style="margin-left: 20px;">FY 03 - CWTS H-1 has been delayed from FY 2001 to FY 2003 in order to perform a weight reduction design change and delta DT to complete the effort. FY 04 - JHMCS P3I program commencement was delayed from FY 2003 to FY 2004 since the delay in the start of operational testing slipped MS III. FY 04 - JALEPV MS III slipped from FY 2003 to FY 2004 due to the revised MS III schedule based on deficiencies being addressed and availability of funding.</p> <p style="margin-top: 20px;">(U) Technical:</p> <p style="margin-left: 20px;">Not Applicable.</p>						FY 2002	FY 2003	FY 2004	FY 2005	(U) Funding:					Previous President's Budget:	7.649	6.695	8.679	7.404	Current BES/Presidents Budget:	8.344	6.547	8.765	8.032	Total Adjustments	0.695	-0.148	0.086	0.628	Summary of Adjustments					Congressional program reductions					Congressional undistributed reductions		-0.039			Congressional rescissions	-0.016				SBIR/STTR Transfer	-0.041				Economic Assumptions	-0.024	-0.109	-0.255	-0.210	Reprogrammings	0.776				Other Navy/OSD Adjustments			0.341	0.838	Subtotal	0.695	-0.148	0.086	0.628
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EXHIBIT R-2a, RDT&E Project Justification								DATE: February 2003	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N / BA-5			PROGRAM ELEMENT NUMBER AND NAME 0604264N/Aircrew Systems Development			PROJECT NUMBER AND NAME W0606/Aircrew Systems Development			

(U) D. OTHER PROGRAM FUNDING SUMMARY:

<u>Line Item No. & Name</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>To Complete</u>	<u>Total Cost</u>
Aviation Life Support - OPN 424400	25.818	18.183	27.749	27.351	53.617	26.318	26.722	27.207		
Aviation Life Support Mods - APN 057500	0	0.493	6.358	4.882	8.369	23.588	21.524	10.718		

(U) E. ACQUISITION STRATEGY:

Commercial Off-The-Shelf (COTS)/NDI where possible, cost plus award fee contracts. Cost as an Independent Variable. Majority of programs non-ACAT programs with no specific acquisition strategies.

(U) F. MAJOR PERFORMERS:

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Exhibit R-3 Cost Analysis (page 1)								DATE: February 2003				
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NUMBER AND NAME						
RDT&E, N / BA-5			0604264N/Aircrew Systems Development			W0606/Aircrew Systems Development						
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 03 Cost	FY 03 Award Date	FY 04 Cost	FY 04 Award Date	FY 05 Cost	FY 05 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Systems Engineering	WX/RX	NAWCAD, PAX RIVER, MD	38.485	2.687	Various	4.793	Various	4.887	Various	Continuing	Continuing	
Systems Engineering	WX/RX	NAWCWD, CHINA LAKE, CA	3.826	0.731	Various	0.764	Various	0.377	Various	Continuing	Continuing	
Systems Engineering	WX/RX	NSWC, INDIAN HEAD, MD	0.425	0.264	Various	0.340	Various	0.180	Various	Continuing	Continuing	
Systems Engineering	WX/RX	NADEP, CHERRY PT, NC		0.180	Various	0.115	Various	0.090	Various	Continuing	Continuing	
Systems Engineering	WX/RX	NAWCAD, LAKEHURST, NJ		0.071	Various	0.073	Various	0.073	Various	Continuing	Continuing	
Ancillary Hardware Development	TBD	NAVAIR		1.150	Various	1.250	Various	0.603	Various	Continuing	Continuing	
Award Fees												
Subtotal Product Development			42.736	5.083		7.335		6.210		Continuing	Continuing	
Remarks:												
Integrated Logistics Support	WX/RX	NAWCAD, PAX RIVER, MD	16.785	0.304	Various	0.500	Various	0.460	Various	Continuing	Continuing	
Integrated Logistics Support	WX/RX	NSWC, CRANE, IN		0.200	Various	0.250	Various	0.200	Various	Continuing	Continuing	
Studies & Analyses	WX/RX	NAWCAD, PAX RIVER, MD		0.300	Various						0.300	
Award Fees												
Subtotal Support			16.785	0.804		0.750		0.660		Continuing	Continuing	
Remarks:												

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Exhibit R-3 Cost Analysis (page 2)										DATE: February 2003		
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NUMBER AND NAME						
RDTE, N / BA-5			0604264N/Aircrew Systems Development			W0606/Aircrew Systems Development						
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 03 Cost	FY 03 Award Date	FY 04 Cost	FY 04 Award Date	FY 05 Cost	FY 05 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WX/RX	NAWCAD, PAX RIVER, MD	35.880	0.450	Various	0.492	Various	0.182	Various	Continuing	Continuing	
Developmental Test & Evaluation	WX/RX	NADEP, CHERRY PT., NC	0.221	0.090	Various	0.075	Various	0.230	Various	Continuing	Continuing	
Developmental Test & Evaluation	WX/RX	NSWC, INDIAN HEAD, MD		0.120	Various	0.113	Various	0.150	Various	Continuing	Continuing	
Operational Test & Evaluation	WX/RX	COMOPTEVFOR, Norfolk						0.600	Various	Continuing	Continuing	
Award Fees												
Subtotal T&E			36.101	0.660		0.680		1.162		Continuing	Continuing	
Remarks:												
SBIR Assessment			0.041								0.041	
Subtotal Management			0.041	0.000		0.000		0.000		0.000	0.041	
Remarks:												
Total Cost			95.663	6.547		8.765		8.032		Continuing	Continuing	
Remarks:												

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Exhibit R-3, Project Cost Analysis
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EXHIBIT R4, Schedule Profile																									DATE:							
APPROPRIATION/BUDGET ACTIVITY										PROGRAM ELEMENT NUMBER AND NAME										PROJECT NUMBER AND NAME												
RDT&E, N / BA-5										0604264N/Aircrew Systems Development										W0606/Aircrew Systems Development												
Fiscal Year	2002				2003				2004				2005				2006				2007				2008				2009			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Acquisition Milestones																																
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CWTS																																
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ESIRP																																
Production Milestones																																
PPA																																
MARS																																
JALEPV																																
JHMCS																																
Deliveries																																

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Exhibit R-4, Schedule Profile
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Exhibit R-4a, Schedule Detail
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COST (\$ in Millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Project Cost	0.977	0.977						

(U(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:

The FY 2002 funding is needed to improve ejection seat performance, increase crashworthy protection, and reduce risk of injury to ejecting aircrew. This improvement is needed due to the introduction of newer technologies to enhance war fighting capabilities through the use of additional aircrew attached information systems (i.e. Helmet Mounted Displays), and more man-mounted equipment. This effort will help mitigate the increased physiological loading imparted to the aircrew as a result of these newer technologies, and still maintain current risk of injury envelope and protection. Funds will be used to reduce physiological loads by developing modular devices that can be used to improve stability and restraint of the IIIS Ejection Seat.

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(U) B. Accomplishments/Planned Program				
	FY 02	FY 03	FY 04	FY 05
Accomplishments/Effort/Subtotal Cost	0.977	0.977		
RDT&E Articles Quantity				
FY 2002: Initiated development of restraint improvements and identify integration risks. Contract Award November 2002. FY 2003: Continue to develop restraint improvements and identify integration risks.				
	FY 02	FY 03	FY 04	FY 05
Accomplishments/Effort/Subtotal Cost				
RDT&E Articles Quantity				
	FY 02	FY 03	FY 04	FY 05
Accomplishments/Effort/Subtotal Cost				
RDT&E Articles Quantity				

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(U) C. PROGRAM CHANGE SUMMARY:

	FY 2002	FY 2003	FY 2004	FY 2005
(U) Funding:				
Previous President's Budget:	0.991	0.000	0.000	0.000
Current BES/Presidents Budget:	0.977	0.977	0.000	0.000
Total Adjustments	-0.014	0.977	0.000	0.000
Summary of Adjustments				
Congressional program reductions				
Congressional undistributed reductions		-0.006		
Congressional rescissions	-0.002			
SBIR/STTR Transfer	-0.013			
Economic Assumptions	-0.003	-0.017		
Reprogrammings	0.004			
Other Navy/OSD Adjustments		1.000		
Congressional increases				
Subtotal	-0.014	0.977	0.000	0.000

(U) Schedule:
Not Applicable

(U) Technical:
Not Applicable.

R-1 SHOPPING LIST - Item No. 101

UNCLASSIFIED

Exhibit R-2a, RDTEEN Project Justification
(Exhibit R-2a, page 13 of 13)